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ARTILLERY, AND THE LESSONS WE HAVE LEARNT WITH REGARD TO IT IN THE LATE WAR.

By COLONEL-COMMANDANT L. C. L. OLDFIELD, C.B., C.M.G., D.S.O.

Wednesday, 15th February, 1922.

LIEUT.-GENERAL SIR J. F. N. BIRCH, K.C.M.G., C.B., in the Chair.

THE CHAIRMAN: Ladies and Gentlemen, I do not think it is necessary to introduce Colonel-Commandant Oldfield to you, we all know what he did in France, and I will ask him to proceed at once with his Lecture.

LECTURE.

THE subject of this lecture is a very wide one and in the time permitted it is only possible to deal with a few of the many lessons learnt; others, equally important, can only be alluded to briefly.

The duties and scope of the Artillery increased as the war went on almost daily.

In fact it is not too much to say that when a weapon was developed or invented, the Artillery were at once asked either to help this weapon or to neutralise its effects.

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When the enemy put out masses of wire, the Gunner was asked to cut it.

When his rifles and machine guns held up our Infantry in attack, the Gunner replied with a creeping barrage.

When the Higher Command decided to use gas the Gunner was asked to fire it in especially designed shells.

When Tanks were used in the attack the Gunner had to fire smoke as a screen, and, again, to knock out hostile tanks.

It is, I think, interesting to see how the official books described the characteristics and duties of Artillery in 1914 and 1921.

Briefly, in 1914, Artillery duties were described as follows :—

> " Till the enemy discloses his dispositions Artillery must usually limit its action to preparing to support the other arms as soon as occasion demands it."
>
> " Rapid fire cannot be maintained for more than brief periods without exhausting ammunition."
>
> " The duty of Artillery is to assist the Infantry to establish superiority of fire over the enemy."
>
> " Heavy Artillery is chiefly used with enfilade or converging fire, particularly on buildings and the enemy's guns."
>
> " Siege Artillery may be allotted to the field Army for special duties in connection with Fortress operations."

In 1921 the official book talks of barrages, gas shell, anti-aircraft guns, anti-tank guns, harassing fire, smoke shell, close support of Infantry guns, wire-cutting, co-operation with aeroplanes, counter-battery work, and emphasises the importance of medium, heavy and super-heavy guns and howitzers.

Artillery generally is described as being able to develop an overwhelming bombardment without previous warning, and to engage targets by day and night without observation and yet with accuracy.

Evidently there has been a great proportionate increase in the scope of the arm, but its primary *rôle* remains the same as it was in the days of Napoleon, namely, to assist the other arms in breaking down opposition and to afford all possible support to the Infantry with whom the eventual decision rests.

The train of thought expressed by some other nations that " the Artillery conquers, the Infantry consolidates," has of course no meaning in the British Army of to-day.

It may, I think, be assumed that a future war between Great Powers will begin with a period of open warfare, intense and short, and, failing a decision, a period of position warfare will ensue. This will last until one side, by increased numbers, skill, new or improved weapons, becomes strong enough again to compel the adversary to fight in the open.

With the present state of finances, no nation is prepared to spend large sums on new equipment. A war of the next few years would probably begin with very much the same weapons as were in vogue in November, 1918.

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Still, it should be remembered that, just as the highwayman is more ready for a fight than the honest citizen, so the nation that desires war will generally have the lead in weapons and training.

But from the moment of the outbreak of war, the whole scientific and industrial strengths of nations will begin working at high pressure.

Tanks, aeroplanes, and other expensive implements of war will appear quickly in great numbers, though probably not before either a decision has been reached or position warfare has set in.

We have, therefore, to consider to-day not only Artillery as it would function at the beginning of war, but its duties after a few months of war.

And so perhaps the first lesson the gunner has learnt is to make himself ready to learn new lessons and adapt himself, when the time comes, for new machines and weapons and new tactics.

How many lives might have been saved if it could have been foreseen that an Army in defence would put out barbed wire quickly and that the Artillery would be asked to cut it ?

Surely the next war will see great developments in machine guns, tanks, wireless telegraphy, etc., and the Artillery must be prepared to co-operate with our Army in every kind of way and to neutralise improvements of the enemy.

In the late war the long static period gave us time to think, learn, and invent.

In the next war we may not be so fortunate.

Training of Personnel.

It is necessary, I think, for us all to remember that the British Army exists for all kinds of wars—not only great European wars against enemies of the first class in equipment and training—and that our training must be such as to fit us for many different kinds of fighting.

Above all it is necessary to get out of our heads the idea that we are likely to spend long years of static warfare and to prepare for that mainly. In fact our training should be such as to prevent static or position warfare.

If it does set in we must try and break it down.

Only manœuvre and movement can achieve decision, says Marshal Foch.

And the war of the future must be visualised always as a moving warfare.

Tactical exercises and practice camps have shown me how deeply rooted in our minds has the idea become that quickness of decision and action are no longer essential.

Commanding officers responsible for training will find only too many opportunities for rubbing in the necessity for an Army being even more mobile than it was in 1914.

Evidently much more is being demanded from the Artillery officer of to-day than before, and still more will be wanted in the future.

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It is not enough for even a junior officer to know one gun and its equipment and ammunition thoroughly. He must not be a specialist in one branch of the arm. He must receive a sound general training not only in his own armament, but in others, and especially in Infantry work, so that he may be ready to take advantage of any changes in weapons or tactics which the future may bring forth.

These changes come slowly in peace time, but rapidly when war has started and economy no longer limits experiments and training.

The aim should be to make the young R.A. officer no longer think of himself as only one of a team whose main object is to create a good battery, but also as ready to assist in any way to help his side to break down the resistance of the enemy.

Indeed, much more attention must be paid to instruction of Battery officers in Artillery tactics. It is not sufficient to be able to hit the target. He must be on hand to hit the target at the right moment, sometimes on his own initiative, sometimes at the request of the Infantry or Aircraft.

It is even more important that senior Artillery officers should be able to think in terms of all natures of Artillery.

At the beginning of the Great War, for various reasons, officers of the Field Artillery had little knowledge of the possibilities and limitations of what was called Garrison Artillery, and *vice versa*.

A recent Committee was of opinion that the two branches of the Royal Regiment should be re-united.

If this re-union is not to take place it is at all events necessary that steps should be taken to ensure that senior officers of the Regiment are kept well up to date with the latest developments of guns and howitzers of all natures and be able to handle them in war. I think this is a lesson which has not received the attention it deserves.

Much more responsible work, too, must be expected of the non-commissioned officer.

He must be taught to rely on himself and expected to observe fire, re-sect positions, lay out lines of fire, and do many of the duties which a subaltern generally does.

This is already done in Foreign Armies, and will help to solve the eternal problem of shortage of trained officers.

If this is done in annual practice camps and tactical exercises as a matter of course, non-commissioned officers will soon learn to interest themselves in their more extended duties and get increased confidence in themselves.

Artillery in Attack.

Pre-war ideas contemplated an artillery duel, after which the winning artillery would concentrate its fire on the enemy's infantry and prepare a way for the attack.

Concealment of guns and map-shooting without previous registration have modified the artillery duel.

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Infantry while advancing cannot develop sufficient fire-power to overcome the greatly increased defensive power of rifles and machine guns.

We thus learnt early in the war that Infantry cannot advance by daylight above ground against defenders who are properly arranged in depth, unless it has mechanical help from other arms. Generally this help is provided by Artillery or Tanks.

It is necessary to call attention to the great difference in the support which the Artillery can provide if time is available to make preparation and bring up ammunition.

In such case the Artillery support may be briefly described as follows:—

(*a*) Most of the heavy and medium howitzers and a proportion of field guns and howitzers try with H.E. shell and gas to neutralise the enemy's guns.

(*b*) A small proportion of field guns advance in close touch with the attacking Infantry. These guns do not take part in the barrage as it is essential that they should be mobile and all ranks fresh when the time comes.

(*c*) The remainder take part in the barrage.

In the German Army this took the form of heavy concentrations of fire from howitzers, field guns and mortars, on different chosen localities, the fire lifting on to a new area according to a time-table. This worked well with specially trained troops when time had been allowed for careful reconnaissance of the position to be attacked. It is, however, less suitable for open warfare when these conditions cannot be carried out. Also the attacking Infantry cannot keep as close to the barrage as in the case of a British or French continuous line barrage.

A British barrage extends in depth into the hostile defence line far enough to smother machine guns and rifle-aimed fire, say 1,500 yards. This belt of fire advances in front of the Infantry at a prescribed rate, which becomes gradually slower as the attackers advance, and pauses on certain lines, the whole moving according to a fixed time-table, which is indicated to the Infantry by a barrage map.

A well arranged barrage of this type with almost unlimited ammunition was one of the causes of the successful attack on the strong position of Beaumont Hamel in November, 1916. It showed great advance on the thin artillery support that was possible at Neuve Chapelle in March, 1915.

An effective barrage of this kind can only be provided for a frontage of 1,200 yards with the guns at present arranged for a Division.

In view of the frontage of a Division being generally much more than this, the deficiency in guns must be remedied in some way, either—

1. By more guns being made available, or
2. By the guns shooting at a greater rate, or

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3. The use of Tanks may make a thinner barrage effective, or
4. By using an effective barrage on certain localities only and taking the intervals by turning movements.

It is likely that this last is a possible solution, provided that the Infantry are highly trained.

Increasing the rate of fire, except for very short periods, is liable to exhaust the gun detachments and lower the accuracy of fire.

It should be remembered that an unnecessarily intense barrage means (for the same number of guns available) a narrower front to attack.

Also a greater rate of fire (for the same amount of ammunition) means less depth of attack.

These are points which the Higher Command must weigh very carefully. Certainly the broader the front attacked the greater the chance of success.

No penetration can be decisive unless it reaches the enemy's gun line in the first rush of the attack.

In fact the barrage is a good servant but a bad master, and must be made to conform to the plans of the Commander.

It should be noted that the guns of the attackers must have at least as great a range as the guns of the defenders which will be arranged in depth. If they have not, the Infantry will not have the barrage to help them as far as the defenders' gun lines.

At the present time the British field gun has not got this necessary range.

If the barrage guns cannot reach the enemy's gun line the only alternative is to advance the guns during the barrage, but not more than half the number being on the move at the same time.

This means that there must be longer pauses or that the barrage will be thin at times while the guns are moving. Re-secting new positions and making new barrage tables involve still further delay.

What I have been describing applies only to a grand attack, when there has been plenty of time for preparation and an ample supply of ammunition.

In moving warfare or where small forces are engaged Artillery support will generally take the form of concentrations on localities for short periods of time.

Or a simple form of barrage can be extemporised in a few hours if gun positions can be accurately re-sected and good maps are available.

But it should be remembered, and especially so by the Infantry, that a brigade of Light Artillery can only provide an effective barrage over about 400 yards, and that the amount of ammunition available in the Division will only allow each gun to fire for one hour continuously.

I think the expression " barrage fire " should not be used for a less number of guns than that in a brigade of Light Artillery.

After General Byng's attack at Cambrai, in November, 1917, all attacks tried to introduce the element of surprise, and it is certain that

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when tanks are used this will always be attempted in future. It will also be tried in moving warfare or when the wire in the defenders' position is not so thick as to require several days' bombardment.

It is probable, however, that, in some way or other, the defender will know an attack is imminent, though the exact moment of zero will be uncertain.

The mobile guns accompanying the Infantry have an extremely difficult task. Their very presence has the greatest moral value, both for their Infantry, and conversely for the enemy's.

They will generally be used as sections or even single guns. These guns should ordinarily not be used for tasks which machine guns could do equally well. A machine gun is easier to conceal and quicker to bring into action.

The proper target for a gun is one which is beyond the power of a machine gun, such as a house, a fortified strong point, a shielded gun or a tank.

In open country it will be hardly possible for them to move in daylight within rifle fire of the enemy and this means great difficulty in communication with subordinate Infantry commanders.

It is in close country fighting, however, that these forward guns will be most wanted.

In such circumstances guns can often be brought up to within a few hundred yards of an enemy's strong point and will not be discovered until they open fire. In some cases Pack Artillery would be more suited for this kind of work than field Artillery, expecially the Pack Howitzer with its high trajectory.

This very close support can be afforded much more frequently and successfully than is generally believed, but needs great skill in reconnaissance.

Another difficulty is that at short ranges guns cannot shoot over the heads of our Infantry unless the ground is very favourable.

In many cases it is the only possible method, as, apart from the communication difficulty, the guns placed at greater range would not clear intervening woods, hedges, houses, etc.

Forward guns of this type will nearly always fire by a prearranged time-table, arranged directly by the Gunner officer with the Infantry unit commander.

As the unexpected machine gun is one of the chief obstacles to advancing Infantry, even when working behind a barrage, it is important that this close Artillery support be thoroughly understood and practised together by junior officers of the two arms.

Certainly it should be a regular feature in both field days and tactical exercises without troops, on the same lines as co-operation between Infantry and Tanks.

Probably improvements in wireless telegraphy or telephony will solve the communication difficulty and the adoption of Field guns on some form of Tank tractor will make the difficulties of advancing under

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rifle fire easier to surmount. But on both these points I shall have something to say later.

A Gunner is often asked as to what time suits him best for the start of an attack. The answer is that, though daylight is less tiring, he can with modern appliances shoot equally well at all hours. As the guns of the attack are shooting from a time-table and by map-shooting his fire cannot be corrected by observations in the earlier stages.

At the same time there is a limit to the endurance of the Gunner in action, and in the Great War, and especially at Ypres salient in the autumn of 1917, he was often set too great a task.

It may be taken as a fact that a barrage in which each 18-pdr. gun fires 500 rounds is about as much as he can undertake without a loss of accuracy in fire, and the same applies proportionately to other natures of Artillery.

Artillery in Defence.

A force in defence has necessarily for the time being given up the initiative, at all events locally. It is this that makes the task of the Artilleryman so difficult.

He is not making out a plan to work with the Infantry in a pre-arranged attack at a chosen time, but has to stand ready to help repel an attack at any time; and this attack may be delivered in many different ways.

I cannot do better than quote four different cases where guns were used with decisive effect on an attacking enemy.

First, the classical case on 15th July in Champagne when General Gourand got from German prisoners the exact time, place, and scope of the forthcoming German attack. In this case the French Higher Command withdrew its troops in the forward zone at the last moment. The German Artillery spent its ammunition on empty trenches and when their Infantry advanced they were overwhelmed by French Artillery firing by a pre-arranged plan. This was the last great German attack which ended in confusion and heavy losses in material and *morale*.

Next I will quote the case of a small German counter-attack made by three weak companies against the 61st Division in April, 1918, just east of Robecq. It seemed certain that the Germans would try to retake a small ridge near Pacaut. The C.R.A. arranged for three bursts of harassing fire to take place at likely times for a counter-attack. One of these bursts of fire was timed for an hour before dawn, and took the form of a creeping barrage over an area of 1,000 yards square just in the enemy's lines. As it happened this barrage just missed the leading company, but practically destroyed the other two companies. The leading company advanced in a hesitating manner and practically surrendered *en bloc*. No further attack was attempted, the British casualties were nil.

The third case I will quote was at the Third Battle of Ypres. On the afternoon of the 23rd September the Germans, in greatly superior

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numbers, counter-attacked from Poelcapelle on to a British defensive flank. This counter-attack was in full view from the British observation stations. The whole attack was broken up and the German Infantry never got within assaulting distance of the defenders' lines.

The fourth case I shall quote was an incident in the Cambrai battle of 20th November, 1917. The attack of the 51st Division was held up at Flesquières by the indomitable courage of one German Artillery officer who, at close range, with his field gun firing direct, knocked out tank after tank as it advanced to make a road through the barbed wire. His gun was just behind a ridge, and so invisible to the British Artillery.

Now these four cases provide us with four chief lessons to be learnt as regards Artillery in defence.

Artillery must be capable of producing annihilating concentrations of accurate fire when ordered by the Higher Command.

Guns must be arranged in depth and even the most subordinate commander must be ready to use his initiative in the most unexpected situations.

Observation must be obtained and communications established at all costs and every opportunity taken of bringing the enemy's advance to a standstill.

The attacking Infantry are advancing at a pre-arranged pace, and if they can be so delayed as to lose their protective barrage they have little chance against the Infantry and machine guns of the defence.

Harassing fire must be carefully arranged by the General Staff so as to inflict casualties and break up concentrations. Every bit of information and probable action of the enemy is to be considered and no round fired without careful forethought.

The arrangement of putting down a protective barrage just in front of a defending Infantry after the attack has commenced finds few supporters now. It is the duty of the Infantry to deal with the first elements of the attackers. The duty of the Artillery is by counter-preparation and counter-offensive to inflict casualties on the enemy, to break up concentrations, and to isolate the first waves of the attack.

The defence, like the attack, must keep a certain number of guns and howitzers, heavy and light, mobile to deal with fresh situations.

Field Service Regulations lay down that Artillery and machine guns are the backbone of the defence. There are always certain areas that are dead ground as far as machine guns are concerned. On the other hand, guns can be sighted so as to shoot almost anywhere. It therefore follows that defensive fire of guns and machine guns must be carefully co-ordinated.

It is also essential that a Senior Artillery officer should be consulted before taking up a position of defence. The German gunner evidently had a lot to do with the siteing of the Hindenburg Line, which gave him safe observation and good fields of fire while denying the same to our Artillery.

Let us consider what a difference it would have made to us if we

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had appreciated this lesson in November, 1914. Surely experienced Artillerymen would have been consulted and the line adjusted so as to give us all possible advantages not only for defence but for offence when the time came.

I am speaking of course purely from the Military point of view. Political considerations might compel a different line of conduct.

Artillery officers must be practised in reconnoitring country with this object in view, so that when asked for an opinion they can give reliable advice. It should certainly be one of the features of Command and Divisional Tactical Exercises without troops.

Artillery fire must be very flexible. In defence command must be more decentralised and yet the Commander must be able at any moment to resume direct command.

Constant reconnaissance must be going on and a ready response made to any calls from the Infantry or from Aircraft.

The defence should try to provide surprises for the enemy and not leave all the initiative to the attackers.

The late war gave many instances where the guns of the defenders became invaluable rallying points to Infantry who had been severely handled.

A well-known case was specially singled out for description in Lord Haig's despatch :—

This was the case where two R.F.A. Officers held the crossings over the La Bassée canal near Hinges for six critical hours on 12th April 1918.

I have made little mention of counter-battery work in attack or defence, as it is better dealt with under a separate heading, and this applies also to gas and smoke.

Counter-Battery Work.

The Artillery duel has taken another form now that batteries fire from concealed positions, and in many cases are kept silent till wanted for serious operations.

As before, the object is to neutralise all hostile batteries which can fire on the Infantry and prevent their movements.

In moving warfare, or where small forces are engaged, the Artillery commander of the force makes use of the guns at his disposal. But with larger forces, or when the fighting has assumed a static character, even for a few days, a regular system of counter-battery work comes into play.

Each Corps has a Counter-Battery Staff Officer whose duty it is to locate the enemy's guns by every means at his disposal and prevent their firing either by :—

1. Destructive shoots with ground or air observation or by means of sound ranging.
2. Concentrations of fire by map-shooting.

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3. Neutralising by gas shell, etc.
4. Organised harassing fire, which affects their supply of ammunition and supplies.

Any or all of these methods may be used successfully, but they all require a very free use of ammunition.

For instance, under the most favourable circumstances it is calculated that a 6-inch howitzer would require about 500 rounds to knock out a hostile battery by direct hits with destructive fire, and the other methods are even more extravagant in ammunition.

In static warfare it may be taken that almost every active hostile battery will be located so long as it remains in one position.

Besides flash spotting, ground and air observation, the counter Battery Staff Officer has new methods of locating guns.

The two most important ones are air photography and sound ranging.

On an air photo a trained eye can locate almost every battery as it is, even with the freest use of camouflage, almost impossible to hide tracks made by bringing up supplies and ammunition unless the gun position is actually on the edge of a road. Of course such a site for a battery is very undesirable for other reasons.

To the pre-war Gunner sound ranging seems almost miraculous. A sound ranging section can locate a hostile battery to within 50 yards and give the position of the shell burst and the calibre of the gun. It can then range a battery successfully on to the hostile battery and correct its fire—all this of course only when conditions are favourable, but it shows the immense possibilities of the new invention.

During a moving fight ground observation is the best of all methods, but if I may be allowed to prophesy, I think that most counter-battery fire will take the form of concentrations fired in answer to calls from aircraft. Every Field Artillery brigade and Heavy or Medium battery has its own wireless set, which should be always on the alert to answer such calls.

Indeed, our French friends believe that the days of pinpoint firing are over and that it is in concentrations that Artillery of the future will be chiefly engaged. This may be the case, but I hope it will always be part of the creed of a Gunner that unobserved and uncorrected fire is only permissible when there is no alternative.

Gas and Smoke Shell.

The advisability of using gas shell seems to be still a matter for consideration in the minds of statesmen. For us as soldiers the obvious duty is to prepare for its use when and if we are allowed to use it.

Evidently its use against uncivilised or even badly equipped enemies might in some circumstances be decisive.

The best known instance of the use of gas shell on a large scale was in September, 1917, when Von Hutier completely overwhelmed the Russian positions, thanks to surprise and the intensive use of gas shell.

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Gas shell contains many kinds of poisonous fluids, which may be roughly grouped into two classes.

First, persistent gas, which lingers for a long time when weather conditions are favourable; and secondly, non-persistent gas, which soon disappears.

It should, however, be clearly realised that gases have many and varying characteristics other than their relative persistence; "penetration" is one of these, *i.e.*, I mean by penetration the power of gas to penetrate an enemy's gas mask.

"Penetration" is, of course, a variable power, depending on the continuous struggle between new gases and new respirators.

Gas is a new weapon, with almost unlimited possibilities against combatants and non-combatants alike. Persistent gas shell should never be fired in the attack without reference to the General Staff or to the Infantry commander concerned. With this exception, gas shell will be used like other shell—that is, at the discretion of the Higher Artillery Commander.

Gas clouds can be produced by all natures of guns and howitzers suddenly opening concentrated fire at a quick rate.

Splinter proof cover, including buildings of all sorts, presents very unfavourable targets for attack by gas shell, which may for this reason have their decided part in future moving warfare.

The effective use of gas shell depends on :—

(*a*) Suitable meteorological conditions, together with a knowledge as to how best to turn those conditions to account.

(*b*) Appreciation of the properties of the various gas shell at disposal.

Limitations of transport under moving warfare conditions demand that the proportions of shrapnel, H.E., gas and smoke shell shall be carefully determined before movement takes place.

In static warfare it has a most demoralising effect on all ranks. The nation which wants a war will probably first make certain of a plentiful supply of some especially poisonous gas, which will give it a great advantage.

It must be remembered that gas is the cheapest engine of destruction we know of.

It is certain that all the leading nations are busy experimenting at the present time and that gas is already a far more serious factor than it was in 1918.

The outbreak of war between the leading nations will probably be heralded by tremendous gas attacks, which may have most serious consequences on *personnel* and *morale*.

Smoke.

Smoke is a weapon for attack, to conceal movements of troops and especially of tanks. It gives some of the advantages without the dis-

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advantages of a night attack. It will probably be used largely in future in the attack. A defending force will, generally speaking, do nothing which would decrease its power of observation.

Map-Shooting.

One of the most important developments during the war is in the direction of Predicted or Map-Shooting. Though no Gunner worthy of the name will ever neglect an opportunity of observing and correcting his fire by some means or other, the fact remains that a very high proportion of his fire will be unobserved and its accuracy will depend on the care and skill which have been exercised before opening fire.

In the words of the Field Service Regulations, the Artillery is able under certain conditions to develop an overwhelming bombardment without previous warning, and to engage targets by day or night without observation and yet with accuracy.

All barrage fire in attack, all gas and smoke shell fire, all night and dawn firing and most of the harassing fire depend on skill in map-shooting.

Even when observation is possible it is equally important to try and put the first burst of shell-fire near the target, as this is the only chance of catching the enemy unprepared.

During the process of ranging a good target men will naturally disperse and get under cover.

This is a point which the old-fashioned Gunner, for some reason, is apt to overlook.

It is worth while considering briefly the "certain conditions" I have given. They are as follows:—

1. The guns must be calibrated, that is, their muzzle velocity must be known under normal conditions. This is fully recognised, and every gun is marked with its muzzle velocity and the date on which it was last determined.
2. The meteorological conditions of the moment. This is met by sending out messages from Meteor six times in every 24 hours. In the last war these messages were sent by telephone wires. In the next they will almost certainly be sent by wireless.
3. The ammunition must be constant or grouped, according to weight. I will refer to this again later.

If the above conditions are carried out a well drilled battery can shoot down to within the error of the gun, *e.g.*, an 18-pdr. at 4,000 yards would drop all its shell within 80 yards of the target, *provided the maps are accurate* and give sufficient detail.

But the last condition is very difficult to secure, a fact which we are led to overlook because of the extreme accuracy of our maps in the theatre of war on the Western Front.

For accurate map-shooting the scale of the map must not be smaller

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than $\frac{1}{80000}$th, say, 2 inches to the mile, and the levels must be contoured accurately to within 40 feet.

It is a fact that at this moment no such maps exist, except for the British Isles and some recent theatres of war.

If, therefore, our Artillery were asked to do accurate map-shooting or fire a barrage in a country such as the Balkan States they could only do so within the limits of accuracy provided by the maps.

Probably science will solve this, too, for us, if time and resources permit. Even now our Survey Department can map country from aeroplane photographs and print maps accurately in a few hours.

There are indications, too, that it may even be possible to obtain the levels of country so photographed, and it is of great importance that this great difficulty be successfully negotiated.

What is called "Survey Work" has become part of the duties of the Artillery officer. Not less than one officer per battery must be proficient in this, and all officers must have a good working knowledge of the latest methods of laying out lines of fire by day and night.

Communications and Observations.

These in future will nearly always be by telephone, wireless, or orderly. And it is of the greatest importance to develop wireless. The present C.W.W. is heavy, and its messages are liable to jamming. But even if it does take three men to carry one set, this is nothing to the number of men required to keep a line in working order.

In the smoke, gas and confusion of the modern battlefield I am afraid the flag and lamp will be of little value even in a moving battle. Till the wireless problem is solved recourse must be had sometimes to coloured lights to call on the Artillery for fire from the front line, though this method is both prehistoric and unsatisfactory.

It is of primary importance that Infantry officers should see that these signals are only sent on the right occasions. A wrong signal may mean a sleepless night for many tired men and wrong expenditure of tons of valuable ammunition, all of which has to be brought up under fire.

The most vital communication of all is *liaison* between officers of the different arms, and, however great the shortage of Artillery officers, this *liaison* should not be stinted.

It is difficult to overestimate the importance of communications in war, and as experiments in wireless communication are relatively inexpensive it is reasonable to hope that great strides will be made in the next year or two in both wireless telegraphy and wireless telephony. Most Artillery officers would prefer money and energy to be spent on this to almost any other expenditure.

I hope that what I have said as to the possibilities of map-shooting will not have given the impression that observation has become less important, for nothing is further from my thoughts.

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It is true that much of our observation will come from the air, but, whenever at all possible, ground observation is the best, it being always remembered that observation without prompt and reliable means of communication is of little value.

Further, observation is not the duty only of the Artillery. Our resources are limited, and we must have the help of observers of other arms, who mnst be able to communicate with the guns.

I think I would call this one of the important Artillery lessons of the war.

Supply and Material.

A few remarks on supply and material will be of interest.

The number of types of guns and howitzers must be reduced as far as possible, not only to facilitate manufacture in quantity, but to simplify supply in the field.

The minimum range should be 10,000 metres.

As many field guns as possible should have the new split trail with wide traverse to knock out tanks.

Certainly the flank guns of field batteries should be equipped with this trail at once.

The different patterns of weights of shells, fuzes and explosives must be reduced to one standard type for each nature of shell; otherwise quick and accurate map-shooting will be impossible.

Arrangements must be made in peace time with industrial concerns so that suitable plant is ready to enable them to turn on to munition-making without delay. Some idea of the expenditure of ammunition in the war may be realised when I say that the Fourth Army fired 3,700 waggon loads of 18-pdr. ammunition alone on the one day of 8th August, 1918.

As regards guns and howitzers heavier than Field Artillery.

We began the war with 500 pieces of Artillery, all being field guns and howitzers, except 24 60-pdrs. We ended with 6,500 pieces of Artillery, of which two-thirds only were field guns and howitzers.

This high proportion of the heavier natures was due no doubt to the long period of position warfare. In the next big Continental war a new proportion will have to be fixed. But it is certain that the Expeditionary Force will have at least one-quarter of its guns and howitzers of medium and heavy types.

Mechanical Transport of Artillery.

I must say a few words about Mechanical Transport of Artillery, for, whether we like it or not, it is bound to come, though not so soon as some enthusiasts think and hope.

In 1918 the French reinforcing batteries of 75's were tractor drawn and tractor carried. A lorry carried one gun complete and drew another.

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These " Porte " batteries could cover 100 kilos in a day and bring the detachments quite fresh into action with 200 rounds of ammunition per gun. The chief drawback was that they had to keep to the roads and occupy positions along the sides of roads.

At the end of the war the American Artillery was approaching what they called motorisation as quickly as possible.

At present the calibre and weight of the field gun is decided by the limit that a six-horse team can pull. With mechanical transport the whole question of calibre can be reviewed afresh.

Besides expense the only limit appears to be the strengths of the road, bridges, and the number of vehicles to carry the ammunition and spare parts. After initial expense, mechanical transport is cheaper and requires fewer personnel. Tanks do not require constant grooming and exercising.

I might hazard a guess and say that at the end of the next war the rapid moving artillery, working with the Cavalry or Tanks, or in close support of the Infantry, will be field guns on armoured tanks and capable of firing off the tanks.

All other guns for barrage, etc., will be drawn into action unlimbered.

There are, of course, many difficulties to be got over first. Amongst others, reconnaissance, supply of petrol, etc.; but science will solve these problems too, very rapidly when the necessity is clear and expense no longer thought of.

All nations are experimenting. Our first M.T. Field Brigade, R.F.A., has just come into existence.

The French inventors are already busy. The French Higher Command think that the difficulty of hiding artillery horse lines is so serious as to compel this change to mechanical transport, even if there were not other advantages.

The increased scope of Artillery has necessitated a great increase in expenditure of ammunition. This is a big problem even in position warfare, where dumps can be formed and light railways laid.

But we have learnt that there is a great expenditure in moving warfare also. In this case the problem can only be solved by mechanical transport. Probably an almost unlimited supply of lorries, similar to the present 3-ton lorry, will be easily acquired in an industrial community; but such lorries do not fulfil all requirements.

Some at all events of the lorries must be able to go across country right up to the gun positions.

Conclusion.

The most important lesson of all is a very old one, but one which in the Great War was driven home to us all. And that is Artillery must be used in closest *liaison* with the other arms.

Though its *rôle* has become a greater one under modern conditions, the best can only be got out of it when it thoroughly understands and

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is understood by the other arms. There is no mystery about the tactical employment of Artillery, and other arms must know its powers and limitations.

From the nature of the subject of this Lecture I have been forced to talk much about machines and implements of war and so I will conclude by quoting the words of the greatest Gunner of the present day, Marshal Foch:—

"Success will only be achieved by movement and manœuvre. The fighting of the future will be sometimes on positions, sometimes between positions, and sometimes purely in the open. The organisation of armies and their fighting methods will develop as machinery and material improves, but the principles will remain unchanged. *Morale* will always remain in war the supreme argument. The sound moral education of the soldier will always remain the chief factor of success and victory."

DISCUSSION.

BRIG.-GENERAL H. DE T. PHILLIPS: Mr. Chairman, Ladies and Gentlemen, the Lecturer, as he told us, had to omit many points owing to being much pressed for time. There was one point in which, I think, everybody is much interested at present. He talked of the great importance of aircraft in warfare, and I suppose every soldier has, at times, at the bottom of his heart, cursed the introduction of aircraft, from the point of view that operations involving secrecy or surprise must be conducted at night, which means much discomfort to all concerned.

We have all known in past years of the struggle of "guns *versus* armour," which has almost become a proverbial expression applicable to the principle that the latest development of one method or means must be countered by the development of something to oppose it.

Aircraft have undoubtedly done more to revolutionise warfare than any previous invention, and the great desideratum of the moment appears to me to be the concentration on some method or means that will nullify or minimise the influence of aircraft, whether in their *rôle* of observation or bombing or the possibility, of which we have read much in the papers but taken little notice of, of large numbers of aircraft, in flocks, transporting large numbers of men and dumping them down behind the enemy's lines. Well, I think a target of that nature could be easily dealt with by our existing guns of all natures and, in any case, the dumped force has either to maintain itself there or get away again, a matter of some difficulty.

In the late war even single aircraft were sometimes brought down from great heights by a single anti-aircraft gun. A flock about to alight ought to be easy to "brown." But we want something more to make it unpleasant for aircraft at all times. We want, to begin with, a weapon of very high muzzle velocity, and we must make a study of the different ballistics involved when shooting at very high angles of elevation. Our old assumption of the "fixed trajectory" is no good. The first thing, the high velocity gun, appears to have been already invented in America, by John Temple, and in some other country. Having got the gun we should concentrate on ballistics and devise a possible method of minimising the action of aircraft.

Another new development which has been successful is the tank, but how to find a certain method of destroying tanks I do not know. Yet, so far as we

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have been predominant in that line, our possible enemies are probably busy studying methods of countering tanks.

Again, the lecturer mentioned trench warfare, and the preference expressed by all soldiers, at any rate in our own army, for the conditions of moving warfare. There is, however, one point in this connection to consider. In the late war, other nations learnt the possibility of the British raising a far bigger army than they imagined. In that respect our cards are now on the table. We raised and trained that army, without at once resorting to compulsory service, during the war.

I may be wrong, but I do not think we should have been able to wait for that army or train it nearly as efficiently had it not been for the period of trench warfare, which in this respect was a Godsend for us. Trench warfare has many objections, but I think other nations will grasp the fact that it enabled us to train a large army. As long as we only maintain a very small army and have no compulsory service, other nations will not want to give us an opportunity of improvising a similar army. It would, therefore, be in the interests of any enemy with a larger army to try and force an early decision by great pressure during the initial period of open warfare.

The lecturer also touched on the question of the re-amalgamation of the branches of the Artillery. He said he believed it was the opinion of the higher Staff of our army that it wasdesirable, and I think that nearly every gunner with whom one has discussed the matter is of the same opinion. He pointed out that heavy artillery will in future form a quarter of the artillery strength of any Expeditionary Force. This being so, surely makes the amalgamation of greater importance than ever before. The recognition of the value of heavy artillery grew, but grew slowly, after the South African War. One of the few lessons of the last Balkan War was the undoubted value of heavy artillery in battle. The Germans seem to have grasped the lesson, and took the field with a comparatively large strength of heavy guns, with the result that we started with a distinct disadvantage. As we shall probably start the next war with an increased proportion of heavies, I think an immediate amalgamation of the Artillery would bring about that perfect *liaison* within the Artillery which the Lecturer so rightly insisted on as being essential between Artillery and the other arms. I think that is all I want to say.

MAJOR-GENERAL W. H. ANDERSON (Staff College): Mr. Chairman, Ladies and Gentlemen, I am afraid I am called upon under circumstances which make it very hard to produce anything, but I have been rather pointed to as the Infantry soldier in the midst of the wolves of the Artillery. I should like to get on to a point affecting the Infantry now very closely indeed. It is a question whether the forward sections of artillery are near enough to the battalion commander of the Infantry who is responsible for some 800 men, and who may possibly be attacked by tanks when not immediately supported by artillery with whom he is in communication, and who may wish at once to have moral and material support for his own men. Does it not mean getting back to the battalion gun? Can that gun be manned by our Infantry? Is it sufficiently simple, or does it require Artillery personnel, that is, to give immediate support, not to a brigade commander of Infantry, but to a battalion commander of Infantry?

MAJOR-GENERAL G. D. JEFFREYS, C.B., C.M.G. (London District): Lord Horne, General Birch, and Gentlemen, I feel like General Anderson that I am among a distinguished company of gunners, and that a mere Infantry man is almost guilty of presumption in venturing to say anything; but as General Birch has called upon me, I feel it incumbent on me to get on my legs. I should like to say

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how heartily I and every Infantry soldier will agree with the Lecturer in emphasising the necessity for greater *liaison* between Artillery officers and Infantry officers in the field. I believe, if I may venture to say so, that it was the greatest want in our pre-war training of any as regards mutual co-operation between the two arms. I do not think the average Infantry officer at the beginning of the war really knew anything of the methods and the tactics of the Artillery, and I think I might also say that the average Artillery officer knew almost as little of the tactics and the methods of the Infantry in the front line. I hope I am not libelling the Artillery in saying that. I think also (it is rather getting off the rails) that in our training in the future it will be a great thing if we remember that as we go on there is a tendency to create new arms and new branches of the Service which live in water-tight compartments and which are totally ignorant of the methods and the tactics and the ideas of the other branches. To my mind it was not only not a retrograde step, but very much the reverse, when the independent existence of the Machine Gun Corps was brought to an end, because if machine gun officers are not practical Infantry officers, in touch with Infantry thought and tactics, they are worth very little—the same applies, *mutatis mutandis*, to the relations between the Artillery and the Infantry. If they are not in the closest touch, if the Artillery officer does not understand Infantry tactics and ideas, and conversely if the Infantry officer is not in touch with Artillery methods of working and tactics, we shall never get the full co-operation in the field which we all know and all admit to be so essential. That is all I will venture to say on the subject.

General Lord Horne: General Birch, Ladies and Gentlemen, it had not been my intention to join in the discussion to-day, because I have on three quite recent occasions given expression to my views in this building. Leaving all technical subjects on one side, which no doubt will be commented upon by our Chairman, I think there are one or two points that come into prominence from this lecture. The first is the importance of research and experiment. We read of the necessity for economy and we all admit that necessity, but I note with very great regret suggestions that our schools of research and experiment should be cut down. Now, however small our Army may ultimately be, surely it ought to move with the times, and if it is small, it should be the very best equipped both in material and in scientific knowledge. The second point is a matter which I hope it is not wrong to refer to in connection with this lecture. This lecture must have impressed on those of us present that artillery and similar appliances for the assistance of the infantry have during the last few years assumed much greater importance than they ever had before. Is it not reasonable to think that that importance will increase as time goes on? Yet the shadow of the Geddes report is hanging over us. That report suggests that, because our auxiliary Arms are better equipped and are more scientific, therefore they should be cut down. The suggestion that because we have advanced in weapons and appliances, for that reason our Army should be reduced, runs through the Geddes Report. Are other nations, other possible enemies, not making equal advance in weapons and appliances? If we had carried out the principles of the Geddes Report, we should still be as in the days of the bows and arrows of Hastings or the men in armour of Poitiers or the muzzle-loader of the Crimea. I cannot follow the argument that because we are better equipped, that therefore we can do with less. Are our possible Opponents going to follow that line? I think that all those of us who have had practical experience of war should, as far as we can, point out the fallacy and the futility, may I say, of arguing on such lines as that. Perhaps I have gone rather beyond the bounds of what I should say at this lecture, but still as I listened

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to Colonel Oldfield I could not help feeling that those who heard him to-day must have realised the importance of the auxiliary Arms and the importance of ensuring that they are maintained at their highest state of efficiency.

COLONEL OLDFIELD: Ladies and Gentlemen, with regard to the question of Anti-Tank defence referred to by General Anderson, I had something to say which got rather crowded out for lack of time.

Officers in the Tank Corps contemplate three different types of tank. First, the fast independent tank, which has hardly as yet come into existence; secondly, the transport tank; and, thirdly, the slow moving 5-miles an hour tank which moves with the Infantry and may be taken as a form of Infantry—in fact, as armoured Infantry soldiers for attack purposes.

Of course no Gunner likes the idea of his guns being dotted over an area in case the enemy attacks with tanks. On the other hand no doubt guns that are suitably sited will be always used, and will be the deadliest enemies of the tank.

Looking into the future I foresee some form of shoulder weapon being the natural usual weapon against the tank. That shoulder weapon would be with each Infantry Battalion, manned perhaps by the members of the Tank Corps if Infantry think they already have too many different weapons to carry.

To make Anti-tank defence the job of the Tank Corps would appear to be the most satisfactory solution of the problem.

THE CHAIRMAN: Ladies and Gentlemen, it is left for me to sum up. Nobody wants war, in fact everybody hates it, but it is the duty of the soldier directly one war is over to think of how to defeat the King's enemies in the next. The Great War saw the development of two new Arms (as this is a gunnery lecture, I do not apologise for talking gunnery shop) and in them the appearance of two principal targets for the artillery; one the aeroplane, the other the tank. There are some people who now go so far as to say that in the next war there will be nothing but tanks and aeroplanes. I do not believe it; we shall have more machinery, but no war will ever be finished with tanks and aeroplanes alone. I think that the battle of 8th August, 1918, gave us the best line of thought for the future, or rather the best line along which we may start thinking about the future; it was Lord Rawlinson's—the 4th Army's—battle. There we had more tanks than we had ever used before, conditions for their employment were favourable in every way, and we had unlimited ammunition. I had something to do with the gunning of that Army, as you know, and some of you will be surprised to hear that I could get enough field and heavy guns for it and could get the ammunition, but the anti-aircraft guns bothered me; I could not find enough. Poor General Budworth, whom some of you knew very well—I am sorry to say he has gone—wanted anti-aircraft guns for every advancing unit and he was not very far wrong.

Protection of our troops from the air and tanks are the two main gunnery problems that we can foresee at the moment. There may be many other ones before we go to war again. Then we come to the gun of the future. In France, when the war had been going on for some time, we asked for experiments to be carried out with what we called a gun howitzer (a weapon with many of the advantages of the gun and some of the advantages of the howitzer); to have this weapon with a split trail so that it had a traverse of about 25 or 30 degrees in order to deal with tanks, and with an elevation that would allow it to engage targets in the air. I am of opinion that we cannot go on with anti-aircraft artillery pure and simple, most of our guns in the future will have to fire an air barrage just as they fire a land barrage now. I know that there are mechanical difficulties and inventive difficulties, and so there were, for example, before wireless telegraphy

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was a commercial possibility, but I believe that this is the weapon for which we gunners must work. Of course we have no money now, we shall probably not have any money until too late, but I think we ought to get on as Lord Horne said with experiment and design in the direction indicated. There was one other point the lecturer talked a great deal about—ammunition. I think the expenditure of ammunition is a point that all gunners ought to study very carefully; I could tell you facts about the demands for gas shell and smoke shell in France that you would hardly credit. You must remember the poor man at the dispensing end. If you demand in the field an over-proportion of anything, you will lessen the supply of necessary things; it is a very serious thing changing a manufacture of any sort, especially when you have the organization for it in full swing. We are not allowed to talk politics by the Rules of this Institution, but I would like to say one thing about 1918, which I do not think has ever been said in public before; that is, that we owe a tremendous lot to Mr. Winston Churchill for the way in which he made our ammunition expenditure and our gun expenditure possible in that critical year. He did a great deal towards winning the artillery battle. He certainly shortened the war; he put his priceless energy and his great brain power into Artillery supply and his " drive " made an enormous difference. When you got an expenditure of 24,000 tons of ammunition in 24 hours, to put it mildly, you are apt to strain resources. The lecturer remarked that nobody thought of cutting barbed wire by shell-fire before this war. I cannot make out why we did not; barbed wire had been used in Bulgaria, Serbia and Japan, but the business of cutting it by means of artillery fire never seems to have been taken up. One other remark about tanks. We are on the top of tanks in the artillery at the moment because tanks are not shell proof. When they are made shell proof they will become slow and we shall still have armour-piercing shell to destroy them with. In asking you for a vote of thanks for the lecturer I may say that I rather spoilt his lecture by telling him that it might be too long, and he left out a very interesting part on counter battery work. He said he could have talked for over an hour on this subject alone, and I am sure very well. I would now ask you to pass a vote of thanks to the lecturer for a most interesting lecture.

The resolution of thanks was carried by acclamation and the Meeting then terminated.

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